Regional Integration, International Tourism Demand and Renewable Energy Transition: Evidence from selected South Asia Economies

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Abstract
The aim of this paper is to explore the international tourism demand-renewable energy consumption-intra-regional trade nexus across seven South Asian economies. The Emirmahmutoglu–Kose and Dumitrescu–Hurlin causality test results reveal unidirectional causalities stemming from tourist influx and intra-regional trade to renewable energy consumption. Moreover, bidirectional causality is found between tourism demand and regional trade. Thus, these results are anticipated to generate key policy implications.

Keywords: tourism demand, renewable energy transition

1. Introduction

The volume of international tourist flows across the globe has surged over time. As a result, the factors affecting the international tourism demand have attracted attention amidst researchers (Peng et al. 2015). Moreover, growth in tourism demand is believed to trigger power consumption through both the direct and indirect channels (Lee 2013). Hence, sustainability of international tourism influx can largely be attributed to the reliability of power supply as well. In the same vein, insufficient access to in-grid electrification is often claimed to be the key constraint bottlenecking the growth of tourism demand, both within the national and international spheres. Thus, underscoring the necessity of enhancing the off-grid electrification rates across the tourist destinations, that do not have adequate access to the national grid, incorporation of renewable energy resources for off-grid power generation purposes seems to be a plausible policy move that entails government interventions (Shezan *et al*. 2015).

On the other hand, enhancing the share of renewables in total electricity outputs is often attributed to cross-border power trade, following the indigenous constraints in the form of natural endowment of renewable energy

resources (Amin and Murshed 2016). In this regard, liberalization of trade barriers has often been recommended as a means to initiate a transition from non-renewable to renewable energy use (Murshed 2018). Trade liberalization policies complement renewable energy sector development within the low-income countries in particular (Murshed 2019).

Although a plethora of studies have explored the multifaceted determinants of international tourism demand, the roles of renewable energy adoption and cross-border trade of renewable sources of power have received nominal attention in the existing narrative. Thus, this paper aims to bridge this gap in literature by empirically investigating the causal nexus between tourist arrivals, renewable energy consumption and intra-regional trade across seven South Asian economies, namely Bangladesh, India, Pakistan, Sri Lanka, Nepal, Maldives and Bhutan.[i]

This study is pertinent from the perspective of policy implications with respect to attaining international tourism growth across the South Asia and, at the same time, enhancing cross-border trade of power to curtail the indigenous reliance on the non-renewable fossil fuels for generating power. The growth in international tourist arrivals across South Asia has increased by almost 6-folds between 1995 and 2017, while South Asia's share in the global tourist arrival figures rose by more than 2.3 times (World Bank 2019). These statistics indicate that South Asia is gaining global recognition as one of the emerging tourism destinations. On the other hand, the share of renewables in total energy-use within South Asian has predominantly been below par, with Nepal being the only exception (World Bank 2019). This is a concerning issue keeping South Asia's energy security and environmental sustainability into cognizance. Hence, it can be hypothesized that the causal associations between international tourism demand, renewable energy use and intra-regional trade could impose critically policy implications in this regard.

2. Methodology and Dataset

This study employs a simple linear model in which international tourist arrival is expressed as a function of renewable energy consumption, intra-regional trade participation and other control variables:

$$lnTA_t = RES_t + IRTS_t + lnGDPPC_t + INF_t + U_t \quad (1)$$

where the subscript t refers to the corresponding time period and U represents the error term; TA denotes the number international tourist arrivals which is used to measure the degree of tourism demand; RES refers to the renewable energy share in total energy consumption, used as a proxy for understanding the propensity of renewable energy consumption; and IRTS symbolizes the intra-regional trade share of respective nations in the aggregate

level of South Asian trade, in order to account for the state of regional integration. GDPPC and INF are per capita GDP (in terms of PPP 2011 constant US dollars) and domestic inflation rate (proxied by the consumer price index), respectively, controlling the econometric model.

The variables, where appropriate, are converted to their natural logarithms. This study uses annual data stemming across 2000 and 2015 in the context of all the seven South Asian economies. The data for IRTS has been sourced from the Asia Regional Integration Center database of the Asian Development Bank while data for all other variables are compiled from the World Development Indicators database maintained by the World Bank.

As part of the econometric methodology, the data set is firstly tested for cross-sectional dependence among the panels using the Breusch-Pagan (1980) Lagrange Multiplier test for cross-sectional dependence, suited for panel data sets with small number of cross sections and larger time periods. Table 1 (see appendix) reports the results from the cross-sectional dependency analysis which provides statistical support in favor of the panels being cross-sectionally dependent. Presence of cross-sectional dependence lead to spurious stationarity properties whereby second generation unit root tests are used to account for the limitation of the first generation tests. The stationarity analyses are done tapping the Cointegrated Augmented Dickey-Fuller (CADF) and Cross-Sectional Augmented Im-Pesaran-Shin (CIPS) techniques proposed by Pesaran (2007). The long run cointegrating associations between the variables are estimated using the Westerlund (2005) cointegration method. Finally, the causal linkages are assessed using the recently developed Emirmahmutoglu–Kose and Dumitrescu–Hurlin tests proposed by Emirmahmutoglu and Kose (2011) and Dumitrescu and Hurlin (2012), respectively. Both these techniques are affirmed to handle cross-sectionally dependent panel data sets in contrast to the conventional Granger causality test.

3. Results and Discussion

The results from the CADF and CIPS unit root tests, as reported in table 2, reveal that all the variables are non-stationary at their level forms while they become stationary at their first differences, implying a common order of integration.

Table 3 outlines the Westerlund cointegration test results which provide statistical evidence regarding the presence of cointegrating relationships between the variables included in the econometric model.

Finally, the causality results are presented in table 4. The statistical estimates from both the techniques coincide to conform the robustness of the results across different causality-testing methodologies. The estimates indicate that international tourism demand influences the renewable energy consumption across South Asia, as perceived from the unidirectional causal link

stemming from international tourist arrivals to renewable energy share in total energy consumption levels. This implies that influx of foreign tourist does exert pressures on demand for power, which tend to be met through incorporation of renewable energy resources for power generation purposes. From this finding, it can be partially claimed that renewable energy resources could be ensuring off-grid electrification within the remote tourist destinations across South Asia.

Moreover, a feedback causal association is found between international tourist arrivals and intra-regional trade shares which denotes that not only does greater regional trade cater the pre-requisite of adequate power supply for attracting foreign tourists to travel to South Asia, greater influx of international tourists also tends to facilitate trade between the neighboring countries. This assumption of intra-regional trade influencing energy supply across the South Asian region is affirmed by the statistical evidence of unidirectional causation stemming from IRTS to RES. This could be perceived as an indication of cross-border energy trade taking place between the concerned economies which, in turn, appears to be playing a fruitful role in uplifting the overall share of renewables in total energy consumption across South Asia. Thus, it is ideal for the governments to liberalize intra-regional trade barriers to ease the cross-border flows of energy resources which would ultimately escalate the overall tourism demand across this region.

4. Conclusion

The roles of renewable energy consumption and intra-regional trade with regard to enhancing international tourism demand have received nominal attention in the existing literature. Against this milieu, this paper attempted to empirically bridge this gap in the context of seven South Asian economies. The results broadly point out towards the inter-linkages between these three aforementioned macroeconomic aggregates. The causal estimates revealed unidirectional causality running from international tourist arrivals and intra-regional trade to renewable energy share in total energy, while a bidirectional causal relationship was found between international tourism demand and intra-regional trade. Thus, these findings collectively impose crucial policy implications with respect to expanding the tourism industry, facilitating the non-renewable to renewable energy transition and strengthening the intra-regional trade relationships across South Asia.

It can be assured that implementing appropriate policy measures, keeping these causal estimates into cognizance, could ideally empower the South Asian economies in pursuing their commitment to attain the targets under the Sustainable Development Goals (SDG) of the 2030 agenda of the United Nations; especially SDG 7 which aims to ensure energy security across the globe through greater use of renewable energy resources and SDG 17 which

call for building global partnerships and cooperation for sustainable development as a whole.

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Appendix

Table 1: Breusch-Pagan Lagrange Multiplier Cross-Sectional Dependence test results

$lnTA_t$	RES_t	$IRTS_t$	$lnGDPPC_t$	INF_t
62.272*	69.591*	58.623*	43.183**	62.809*

Note: * & ** denote statistical significance at 1% and 5%, respectively.

Table 2: Panel Unit Root Test Results

Test	CADF		CIPS	
Variable	Level	Δ	Level	Δ
$lnTA_t$	-1.699	-2.614**	-1.861	-4.011*
RES_t	-1.181	-2.413**	-1.325	-4.436
$IRTS_t$	-1.021	-2.662**	-1.226	-3.298*
$lnGDPPC_t$	-1.822	-2.682**	-2.121	-3.318*
INF_t	-1.007	-3.818*	-1.666	-3.589*

Note: Considering trend and intercept; The optimal lag selection is based on the Akaike Information Criterion (AIC); * & ** denote statistical significance at 1% and 5%, respectively.

Table 3: Westerlund panel cointegration test results

Statistic	Value
Gt	-2.345*
Ga	-9.600
Pt	-22.561*
Pa	-10.778*

Note: Considering trend and intercept; The optimal lag selection is based on the AIC; * & ** denote statistical significance of the critical values, under the null hypothesis on non cointegration, at 1% and 5%, respectively.

Table 4: Panel Granger causality test results

Dependent Variable	**Independent Variable**	**Emirmahmutoglu –Kose**	**Dumitrescu–Hurlin**
$lnTA_t$	RES_t	50.51	-0.649
RES_t	$lnTA_t$	77.691*	3.618*
$lnTA_t$	$IRTS_t$	75.219*	2.102**
$IRTS_t$	$lnTA_t$	64.52***	5.689*
$lnTA_t$	$lnGDPPC_t$	159.768*	1.721***
$lnGDPPC_t$	$lnTA_t$	48.223	0.182
$lnTA_t$	INF_t	52.171	-0.247
INF_t	$lnTA_t$	50.682	-0.050
$IRTS_t$	RES_t	51.314	0.201
RES_t	$IRTS_t$	78.898*	2.281**

Note: The optimal lag selection is based on the AIC; *, ** & *** denote statistical significance at 1% , 5% & 10%, respectively.

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[i] The choice of the South Asian countries was based on data availability which resulted in exclusion of Afghanistan.